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U.S. Environmental Protection Agency
Science Advisory Board
Committee: Advisory Council on Clean Air Compliance Analysis (Council)

Summary Minutes of Public Meeting
Date: July 13-14, 1999

Committee Members: (See Roster - Attachment A.)
Date and Time: 9:00 a.m. July 13, 1999 to 3:00pm July 14, 1999 (See Federal Register Notice - Attachment B).
Location: US Environmental Protection Agency, 401 M Street, Washington, DC, 20460
Purpose: To review the draft Prospective Study: Report to Congress, prepared by the Agency as part of implementing Section 812 of the Clean Air Act Amendments (CAAA) of 1990.
Attendees: Chair: Dr. Maureen Cropper; Committee Members: Dr. Gardner Brown (by phone), Dr. Rick Freeman, Dr. Don Fullerton, Dr. Jane Hall, Dr. Charles Kolstad, Dr. Lester Lave, Dr. Paul Lioy, Dr. Paulette Middleton (by phone) ; Dr. Angela Nugent , Designated Federal Official - SAB Staff; Other Persons Attending: Attendees Included: Mr. James DeMocker (EPA, Office of Air and Radiation), Dr. Brian Heninger (EPA, Office of Policy), Mr. Art Fraas, (Office of Management and Budget), Dr. Michael J. Whinihan (General Motors), Dr. Anne Smith, (Charles Rivers Associates), Dr. Bryan Hubbell (EPA, Office of Air and Radiation), Dr. James Neumann (IEC).

Meeting Summary:

The meeting followed the issues and general timing as presented in the meeting Agenda, except where otherwise noted (see Meeting Agenda - Attachment C). There were written comments submitted to the Committee, and there were written requests to present public comments during the discussion.

Welcome and Introductions - Dr. Maureen Cropper, the Chair, opened the session at (9:00 a.m.) welcoming members and consultants (Roster, Attachment A), and reviewed the agenda (Attachment C). Dr. Angela Nugent, Designated Federal Official (DFO) for the Council reviewed the materials that had been provided to the Committee and noted that a complete set of materials was available at the meeting for reference purposes. She reminded panelists that contacts with the Agency or public during the Committee deliberative phase (i.e., prior to production of a consensus draft

report) should involve the DFO to avoid the perception of undue influence. She described the process for completing a final report to be sent to the Administrator, including the production of a public draft. Then she requested that panel members introduce themselves and make a voluntary statement for the record regarding their research and interests related to the review topic.

Discussion of Committee's Advisory (Review) of: the draft Section 812 Study.

Introduction

Mr. James DeMocker (EPA, Office of Air and Radiation) gave the first presentation, an overview of key issues and charges to be discussed, along with an update on actions taken to address Council concerns since the last Council meeting. He also summarized work the project team had yet to complete: (1) western comprehensive and selected urban area ozone modeling ; (2) timber analysis (commercial timber yield, carbon sequestration); (3) impacts on locations beyond 50km from an air quality monitor; (4) agricultural yields; (5) the SONOCO analysis; and (6) specific changes recommended by the Air Quality Modeling Subcommittee (AQMS) and the Health and Ecological effects Subcommittee (HEES). He reported that EPA still hoped it might receive a stay that would defer submission of the 812 Prospective Study to Congress beyond the August 30, 1999 due date. If a stay were granted, he proposed receiving one more round of Council, AQMS and HEES reviews by teleconference. Final editing, printing and distribution of the Report to Congress would then take place by November 15, 1999. If no stay is granted, the Agency would incorporate remaining analyses and suggestions from the Council into the final draft for the August 30th deadline.

The Chair, Dr. Cropper requested that the Agency staff prepare to discuss benefits associated with Title 6, because the Council had never focused in detail on Title 6, which deals with stratospheric ozone, as it had on Titles 1-4. She proposed that the Council convene at 8 am on Wednesday, July 14, 1999, to hear a short presentation and discuss that issue.

Overview of Emissions and Air Quality Modeling

Mr. DeMocker opened the discussion by summarizing his sense of the key conclusions of the AQMS review: (1) that the "emissions trends issue" was resolved in an acceptable way for the current Prospective Study; (2) there were lingering concerns about primary particle inventories, especially motor vehicle carbonaceous emissions, and that this underestimate was potentially significant; and (3) there were strong recommendations about improving emissions inventory information for the next Prospective Study.

Dr. Paulette Middleton participated in the discussion by conference call. She generally believed that the report "looked good" and the Council needed to improve it by highlighting places in the report where strengths and weaknesses need to be noted.

She noted the need throughout the report to draw distinctions between Particulate Matter $(PM)_{2.5}$ and PM_{10} because the modeling conclusions for each will be different and the control strategies and benefits will differ. She recommended that Table 4.6, which described uncertainties associated with air modeling, especially needed to make these distinctions clearer. She also suggested that the terms "potentially major," and "probably minor," used in the uncertainty tables, needed an explanation to inform the reader how those judgments were made. This would provide an overall framework for expressing uncertainty.

The Chair suggested that the importance of various sources of uncertainty could be better understood by showing how a particular benefit, for example, the value of statistical lives saved, is related to (1) changes in emissions (by county), (2) the impact of changes in emissions on ambient air quality, (3) the impact of the change in ambient quality on lives saved, and (4) the value per statistical life saved. Such a framework could also be used in a Value of Information Analysis to determine the impact of reducing each source of uncertainty on the accuracy of estimated benefits.

Dr. Middleton closed the discussion with a recommendation that the Agency remind reader in prominent ways throughout the discussion of uncertainty in the document that there are key uncertainties concerning emissions that are propagated through the analysis.

The Council then turned to specific issues pertaining to emissions that the Agency needed to ensure were discussed in the uncertainty tables: (1) potential overestimate of volatile organic compounds; (2) estimates of ammonia and possible uncertainties with the REMSAD model; (3) potential overestimates of benefits of enhanced Inspection and Maintenance programs; and (4) choice of ozone episodes.

The discussion of emissions concluded with the Chair's recommendation that the emissions in the "counterfactual case" (scenario without the CAAA) in the year 2010 be expressed relative to actual 1990 emissions. This would make it clear to the reader how much worse emissions were predicted to be in the absence of the 1990 CAAA.

Overview of Health and Ecological Effects

Mr. DeMocker described the outcomes from HEES discussions in April and June on health effects issues. He spoke in detail about the issue of a potential lag in PM effects. In that context, he reported on the HEES recommendation that the Agency adopt a Tier 2 SA structure as best estimate and conduct sensitivity analysis for 0, 8, and 15-year lags. He expressed concern that adoption of a lag in this case underestimated benefits if fully discounted. He suggested the lag assumption ignored compromised health status during latency. He also pointed out that scientifically uncertain effects had been traditionally limited to illustrative calculations in 812 studies (e.g., neonatal PM mortality, nitrogen deposition) and that these did not provide best estimates.

Dr. Lioy explained that the goal of the HEES was to encourage sensitivity analyses where there were marginally good data but to forego quantitative analysis in

areas of uncertainty. Infant mortality data and the ozone mortality meta-analysis were also not used for the same reason. The most difficult problem was hazardous air pollutants (HAPs) because there is very poor exposure data, and the risk factors were not "applicable" to realistic human experiences. A very significant gap in the HAPs analysis also involved the same lack of information on the ecological effects.

In regard to the Agency's concern that the lag did not address morbidity effects during latency, the Chair stated that the Agency needed to account for morbidity effects in the appropriate place, not in mortality discounting.

The Council then received two presentations from members of the public. Michael J. Whinihan, from General Motors, argued that there was no strong scientific basis to assign mortality benefits to reductions of PM. He urged the Council to (1) advise the agency to eliminate PM benefits and benefits associated with stratospheric ozone; (2) endorse a 15-year lag for PM effects; and (3) insist on disaggregation of benefits and costs by Title for the current Prospective Study. Art Fraas, from the Office of Management and Budget (OMB), then spoke briefly. He referred Council members to written comments submitted by OMB and by the Council of Economic Advisors. He characterized EPA's analysis as one that presented a primary estimate and uncertainty around the estimate. OMB, in contrast, prefers an analysis that provides high-end and low-end estimates. He emphasized that the compelling benefit equation used by the Agency relied on a Beta coefficient in the Pope study. He argued that the equation did not itself include the uncertainty associated with the Pope Study. He urged members to consider advising the Agency to develop higher and lower-end estimates, to convey the uncertainties associated.

The Council took a break for lunch at 12:15 and reconvened at 1:15; Mr. Robert Flaak assumed the duties of DFO until 2:35. Dr. Anne Smith of Charles River Associates presented comments on the draft Prospective Study. She highlighted the reductions in net benefits of criteria pollutants, when the PM causality assumption is not included. She argued that costs and benefits must be disaggregated by program or subprogram to be useful. She presented hypothesized disaggregation analysis to demonstrate its feasibility. She suggested revisions to the uncertainty table in Chapter 5 (Health Effects). She argued that the Monte Carlo analysis was inappropriate, that EPA should focus attention on critical uncertainties, and check estimates against current health trend data to provide "reality checks."

The Council then turned to a short discussion of ecological effects. Dr. Brian Heninger (EPA, Office of Policy), summarized progress in the assessment of ecological effects. He described progress towards a comprehensive framework for presenting ecological effects and selection criteria developed for ecological service flows in the current analysis. He summarized ecological issues discussed at the HEES meetings in April and June. Dr. Lioy expressed general agreement with the summary presentation and emphasized the need for data and methods to improve analysis in this important area.

Unquantified/Unmonetized Benefits and Disbenefit Categories (Charge Question 4)

Dr. Brian Hubbell, EPA/Office of Air and Radiation, and Dr. James Neumann (IEC), presented the Agency's background information on this issue. The HEES in its April 1999 meeting urged EPA to provide estimates of effects or values wherever possible, but several important unquantified/unmonetized health and welfare effects still remain. The Agency was asking the Council's advice on a screening exercise to determine potential impacts that may help determine whether additional research on benefits is appropriate. They provided several examples to demonstrate the proposed approach.

Dr. Freeman led the discussion (the second discussant on the agenda, Dr. Smith was not present). He suggested that the information regarding the screening analysis came too late in the process for the Council to evaluate and provide thoughtful advice for a report that is due out by August. He proposed that the Agency address the issues thoroughly for the next Prospective Study. Dr. Freeman also expressed concern that listing unmonetized benefits in the Prospective Study may lead to a double counting of benefits. For example, many unquantified health effects are captured by other health endpoints; e.g., changes in airway responsiveness are one mechanism by which air pollutants affect mortality and morbidity. Dr. Cropper generally agreed. She was sympathetic with the goal of the screening exercise--to prioritize research needs—but felt that insufficient information was available to prioritize them at this time. Dr. Lioy stated that the HEES would be unhappy to include this analysis in the Prospective Study without adequate time to review and evaluate it. There was general consensus on this issue.

Value of Avoided Chronic Bronchitis (Charge Question 5)

Jim Neumann introduced the charge question, which concerned the continued use of the adjusted willingness-to-pay (WTP) value of $260,000 derived from the Viscusi et al. study. He reviewed a process for deriving the proposed value and illustrated the results of the derivation. He compared the WTP estimates with several cost of illness (COI) estimates. The lead discussant, Dr. Jane Hall, found the adjusted Viscusi value acceptable and other alternatives not as appropriate. Other members noted that the value is uncertain and advocated that the text discuss uncertainty and distinguish model uncertainty from statistical uncertainty.

Value of Avoided Visibility Degradation (Charge Question 6)

Dr. James Neumann provided a short overview of this issue. Angela Nugent assumed DFO responsibilities at 2:35 during his presentation. He outlined the strengths and limitations in the McClelland, et al. study and alternative studies conducted by Chestnut and Rowe. Dr. Gardner Brown, participating by conference call, served as lead discussant, and advised the Agency to use McClelland et al. as a screening study because the McClelland study was a pilot study, had a low response rate, and imputed a value for people who didn't answer the study. He did not have a

high level of confidence in the application of the McClelland et al. study to support the findings for the 812 Study.

Discussion then turned to the Chestnut and Rowe study, which focused on Park visibility, non/use values. Members noted that the Chestnut and Rowe study wasn't peer reviewed. (Not relevant because of decision to use Viscusi et al.) Another member noted that both studies had been used by Resources for the Future and by Bob Rowe and that those efforts were peer reviewed. There was general consensus that EPA should rely only on the peer reviewed literature. However the Agency could note that additional recent literature, not peer reviewed, is available and could discuss those additional studies.

Value of Avoided Premature Mortality (Charge Question 7)

The Chair asked the Agency not to provide initial oral presentations for the remaining topics, but instead to provide briefing materials to members for background, so that Council members could make more rapid progress in addressing the charge questions. Discussion began with the lead discussant, Dr. Alan Krupnick, presenting reactions to the 4-part charge question concerning calculations of premature mortality. His general conclusions were that presenting "more numbers was better than fewer numbers," and that the Agency needed to characterize uncertainty more clearly and effectively and to move the best estimate in the most appropriate place.

He suggested that the Council not endorse the traditional number of $4.8 million per life saved as the only one in "prime time." He suggested an alternative approach as a model: the Canadian study estimating reducing emissions in diesel, which reviews each possible approach described in the literature (e.g., it looks at the limitations of the labor market studies, looks at the Viscusi life-year approach, and at the Johansson and Johansson study. It does not, however, look at QALYs, which the medical literature uses.) He advised that such an approach would need to include a detailed discussion of uncertainties.

In regard to Question 7c, the use of a 5% rate was accepted as standard. The discussant also endorsed trying to identify people's rates of time preference from their willingness to pay for different risk reductions.

In regard to Question 7d, the discussant agreed that if the Pope study assumed a proportional relative risk change, the 14-year estimate is the appropriate number of life years saved. A more complex approach might be to consider the shifts in survival function, as a way to characterize the commodity of life years saved. This, in concept could be calculated for older populations and younger populations. The Council came to agreement that their Advisory could endorse the 14-year approach for the current Prospective Study and also recommend new approaches to be explored in future Prospective Studies.

The discussion then closed with an extended exchange on characterizing the value of avoided premature mortality. Members noted that there has recently developed a "lot of consensus on QALYs", which influence public health decisions.

Other members mentioned the powerfully distorting effect of the $ 4.8 million per life saved estimate, whose sheer magnitude causes mortality benefits to swamp ecological effects and morbidity effects. Members noted the need to draw on and further develop the literature on risk/risk tradeoffs, which provide a means of comparing life with, e.g., chronic bronchitis, to life in good health.

The Council adjourned at 5:15.

The Council reconvened at 8:15 on Wednesday, July 14, 1999, with Mr. Robert Flaak serving as DFO until 9:00.

Benefits Associated with Title 6

The Agenda was amended to begin the day's discussion with a brief presentation of the benefits associated with reducing stratospheric ozone. Dr. James Neumann introduced Mr. Jeff Cohen, EPA/Office of Air and Radiation, as a source of information on the Regulatory Impact Analysis for Title 6. Mr. Cohen informed the Council that the dose-response function for fatal melanoma came from animal models. The Council suggested that the Agency reword language on page G-12 concerning the analysis of effects. The Council suggested the Agency take several steps in the analysis (1) clearly state assumptions about atmospheric chemistry; (2) clarify when the 2% discount rate is used; (3) clarify whether the green house gas effects of chloro-flourocarbons are net or gross and the impact of US emissions load on total world; and (4) compare the different estimates of melanoma incidence and discuss uncertainties.

Tax Interaction Effects (Charge Question 8)

Dr. Donald Fullerton served as lead discussant and evaluated the scope and content of the discussion of the tax-interaction effect in the draft Prospective Study. Dr. Angela Nugent resumed DFO responsibilities at 9:00. Dr. Fullerton suggested that there were general equilibrium effects and tax interaction effects that were not adequately represented in the current draft. These effects included exacerbations of market distortions resulting from changes in government policies and existed even for "small policies." Tax interaction effects could possibly raise costs by as much as 35% and needed to be shown in benefit/cost ratios. He suggested that 25% was a conservative adjustment to total costs. Dr. Fullerton found draft language in the report misleading. He suggested that the current discussion in the text dismissing tax interaction effects is incorrect and weakens the overall study. He proposed specific changes to the language in the text and advised the Agency to move key discussions to the text from the Appendix.

There was general consensus that the Agency needed to revise its language to acknowledge tax interaction effects. Some members suggested that tax interaction effects needed to be considered on both the benefit and the costs sides of the

equation (e.g., benefits would result from reduced sick days and increased labor supply.). Members acknowledged that including the tax interaction effects was an innovation. They agreed that a discussion of the effects needed to be in the text and in a supplementary table, but not in the central calculation.

Income Adjustments to Willingness to Pay (Charge Question 9)

The lead discussant, Dr. Rick Freeman, found the discussion in the draft text generally acceptable. He asked to see the memo describing how income elasticity was calculated for different effects. The other Council members agreed that the estimates were reasonable. One member raised the question of whether there should be a different calculation for ecological costs, which assumes greater elasticity.

Despite this consensus, discussion turned to the overall approach to valuation for the Section 812 Prospective Study. The debate focused on whether values used in the 812 studies should reflect private or public preferences. The Chair noted that the standard approach in benefit-cost analysis was to aggregate individuals' private willingnesses to pay for benefits. She argued that this approach should be followed in the Section 812 studies, which require benefit-cost analyses of air pollution regulations. An alternative view, put forth by Dr. Lester Lave was that a study that addresses questions about public policy should use public, not individual, preferences. The issue of altruistic benefits (e.g., willingness to pay for other's health protection) was also discussed.

Economic Valuation (Ch 6&7), Discussion of Charge Questions 1, 2, and 3

Discussion began with the topic of economic valuation of non-health welfare effects and of ecological effects analysis. This discussion continued through lunch.

Mr. James DeMocker asked for advice from the Council regarding COI and soiling damage. Dr. Brian Heninger asked for guidance on the use of costs-avoided approach for nitrogen deposition analysis, inclusion of "existence values" as a legitimate source of benefits, and valuation at the watershed or larger systems scale."

There was general consensus among Council members to drop the soiling estimates.

Most of the discussion focused on the proposed "cost-avoided" approach, which the Council agreed should be renamed the "cost displacement" approach. They agreed that the analysis should be retained if the Agency provides a fuller discussion of the estimated costs avoided. Such discussion would clarify where there were "hard regulatory caps," which would necessitate control measures in the event the CAAA were not implemented. The discussion would also identify in detail how estimates of costs were derived.

The Council then turned to a discussion of valuation issues involving human health. Dr. Cropper led off the discussion by addressing a key question: the tension in the Council between what society is willing to pay vs. Council's previous guidance to focus on private willingness to pay. She emphasized the difficulties in (1)

incorporating the concept of "altruism" in the economic analysis and (2) the difficulties of departing from the analytical approach of private valuation to calculate social values implicit in the political process (e.g., using Medicare expenditures to estimate what people are willing to spend to save a life.

To move the analysis ahead, she proposed that the Prospective Study include a variety of calculations of cost-effectiveness. She proposed that it ask the question: "What is the cost of a life and life-year saved as a result of the CAAAs?". The resulting cost of what EPA is spending to save a life (calculated to be approximately $53K) could be compared with QALYs and other public policy choices and the set of information would be offered to readers to make their own conclusions. Dr. Cropper emphasized that the proposal would not replace monetization. Instead, it would provide new and different kinds of information that would let the reader compare costs with what that reader considers the benefits of saving a life. She suggested that the Agency would benefit from presenting information in a way that would not rely solely on the $4.8 million figure.

Council members came to a general consensus on this approach. They agreed that this new information should be presented in a "sidebar" and portrayed as something separate from the monetized benefits.

Direct Costs (Ch 3) Discussion of Charge Questions 1, 2, and 3

The lead discussant, Dr. Charles Kolstad, generally found: (1) the data for cost estimates acceptable; (2) a need for more extensive discussion of models, their validation, and associated uncertainties; and (3) the resulting cost analysis reasonable, with specific qualifiers included. He advised that the Agency consider more information regarding performance degradation costs and asked clarifying questions about costs associated with Titles 2 and 4. A general discussion then followed touching on inspection and maintenance costs, the need for the Agency to review the public/private literature on costs and to put its estimate in the context of costs derived by others, and costs involving low emission vehicles.

Comparison of Costs and Benefits (Ch 8) ,Discussion of Charge Questions 1, 2, and 3

Mr. James DeMocker began by describing the Agency's efforts to disaggregate costs and benefits, in accordance with guidance provided by the Council. EPA has disaggregated costs by title in Table 3-1 in the current draft. For the benefit analysis, EPA has not been able to disaggregate, i.e., map changes in air quality due to changes in different parts of the CAAA because: (1) of limited resources for Air Quality Modeling and (2) of the need to use ambient 2.5 particulate matter as a proxy for all non-lead criteria pollutant premature mortality, because of the lack of data on other chemicals. He propose that EPA begin its work on the next Prospective Study by coming to the Council for a consultation on a data plan early in the process.

The Chair began the discussion by asking some clarifying questions. The Council learned that the current Prospective Study will separate benefits associated

with Title 6 from other benefits. Mr. DeMocker also informed the Council that the Agency is not now able to disaggregate benefits by geographic area. Council members confirmed that data collection methods presently vary widely across different states, so geographic break-outs would not be comparable.

The lead discussant, Dr. Donald Fullerton, applauded the Agency's progress toward disaggregation, but voiced frustration at how limited the disaggregation was. He strongly stated that the Council needs to go on record insisting on disaggregation next round. He proposed that the next Prospective Study disaggregate costs and benefits consistently by pollutant and title.

The Chair noted the resource needs associated with running air quality models for different scenarios to derive the disaggregation information. She pointed out the lack of funding for Models 3, which offers the opportunity to run scenarios on a workstation.

Discussion then turned to the need to present an integrated discussion of major uncertainties in the final chapter. Members focused on the limitations of Table 8-3. One member noted that it did not convey any of the uncertainties associated with the cost estimates. Another member noted that uncertainties are presented in tabular form in individual chapters, but there is no general discussion that integrates that information and describes their relative significance. Yet another member stated that significant information needed to understand the conclusions was embedded in the appendices.

The Council members generally agreed that the text should be revised in the following ways: (1) to discuss emissions uncertainties and PM effects and their significance in the final chapter; and (2) to develop a table of information on uncertainties for the lay reader that would correspond to the calculations in Table to 8.3.

Concluding Discussions and Process for Developing a Draft Report

The Chair opened the floor for public comments but there were no requests to speak. Dr. Cropper then explained that the Council will be developing an Advisory to respond to EPA's charge questions. The goal will be to have a response to the Agency within a month. Council members then volunteered for writing assignments and agreed to submit their drafts to the Chair and the DFO by July 22, 1999. Dr. Angela Nugent suggested that the draft be posted on the SAB public access website, once the Council members had reached consensus on the language. She offered herself as a point of contact for those seeking to learn the progress of work on the Advisory.

The Chair adjourned the meeting at 3:00 p.m..

Action item(s):

1. Council members to send their draft material for the Council letter to the chair and the DFO by July 22, 1999.

The Committee scheduled its next meeting for: no meeting scheduled

At 3:00 p.m., Dr. Cropper adjourned the meeting.

Respectfully Submitted:

Designated Federal Official

Certified as True:

Chair

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by the Council members and consultants (M/C) to the Agency during the course of deliberations within the meeting. Such ideas, suggestions and deliberations do not necessarily reflect definitive consensus advice from the Council M/C. The reader is cautioned to not rely on the minutes to represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters, or reports prepared and transmitted to the EPA Administrator following the public meetings.